Estimating kinetic parameters for essential amino acid production in arabidopsis thaliana by using particle swarm optimization

Abstract:

Parameter estimation is one of nine phases in modelling, which is the most challenging task that is used to estimate the parameter values for biological system that is non-linear. There is no general solution for determining the nonlinearity of the dynamic model. Experimental measurement is expensive, hard and time consuming. Hence, the aim for this research is to implement Particle Swarm Optimization (PSO) intoSBToolbox to solve the mentioned problems. As a result, the optimum kinetic parameters for simulating essential amino acid metabolism in plant model Arabidopsis Thaliana are obtained. There are four performance measurements used, namely computational time, average of error rate, standard deviation and production of graph. As a finding of this research, PSO has the smallest standard deviation and average of error rate. The computational time in parameter estimation is smaller in comparison with others, indicating that PSO is a consistent method to estimate parameter values compared to the performance of Simulated Annealing (SA) and downhill simplex method after the implementation into SBToolbox.